# ISO/IOU T&D Interface

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# *Transmission – Courtesy PG&E*



Local Area Transmission

**Transmission**
- Transmit bulk power from generation facilities to distribution substations
- Largely meshed network design (i.e. power flows from point A to B along numerous paths)
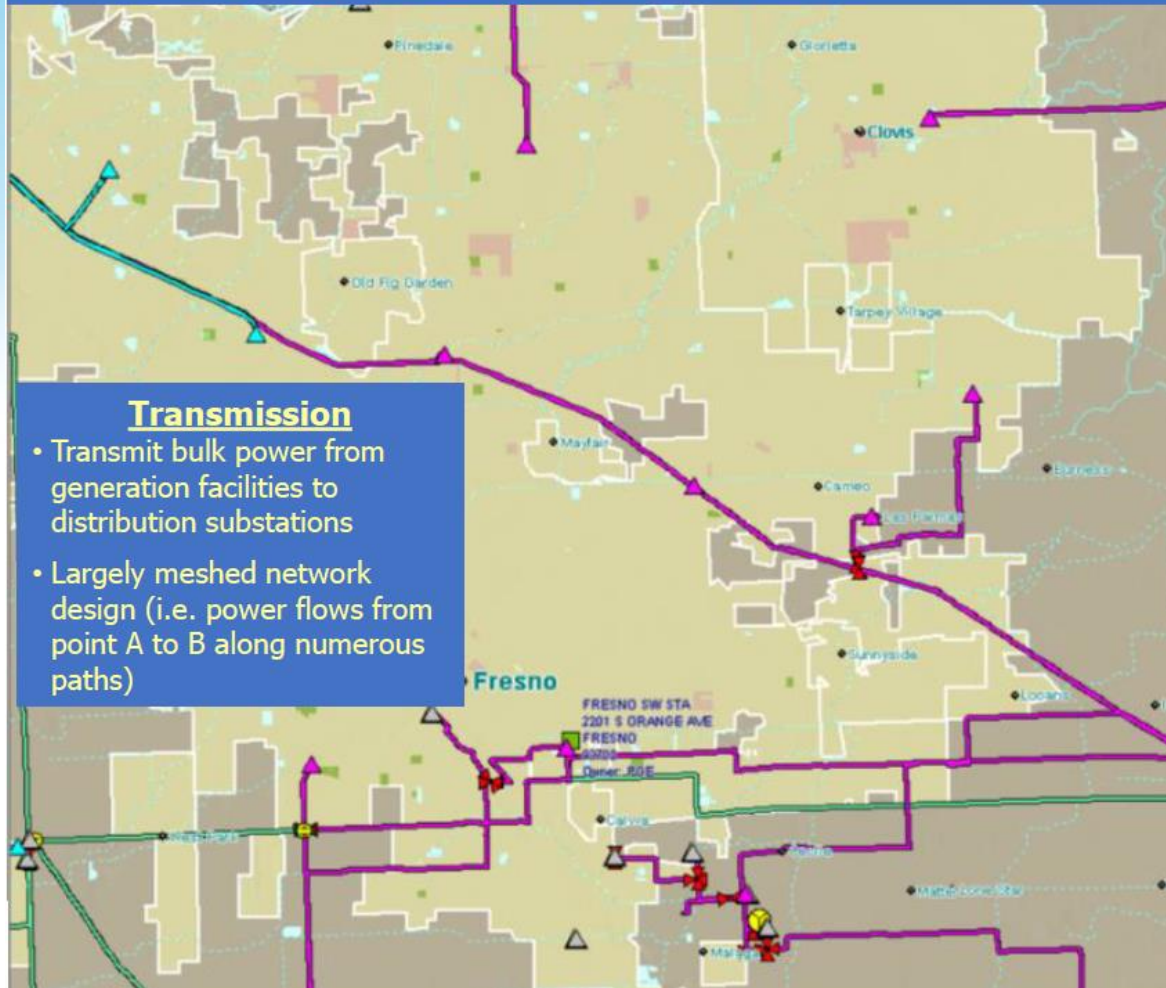
# *Distribution System – Courtesy PG&E*



## Local Area Transmission and Distribution Systems
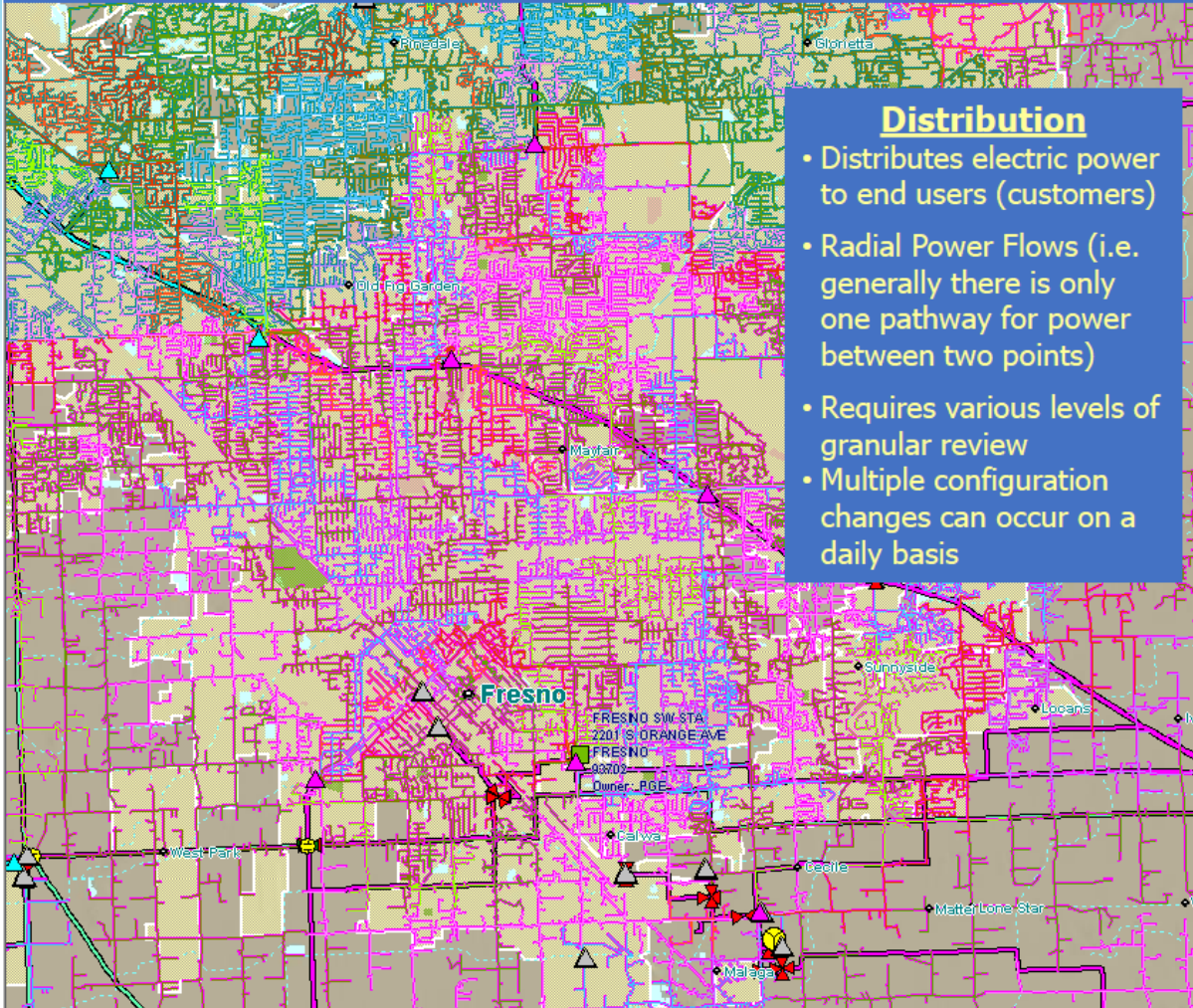
### Distribution
- Distributes electric power to end users (customers)
- Radial Power Flows (i.e. generally there is only one pathway for power between two points)
- Requires various levels of granular review
- Multiple configuration changes can occur on a daily basis

# Distribution Operations – Use Cases

| Number | Use Case Title | Use Case Description | DER Portfolio | Wholesale | Distribution |
|---|---|---|---|---|---|
| 0 | High Penetration | High DER Penetration | No DERA on circuit | No | No |
| 1 | Single DER: Wholesale | DER with single interconnection point participating in wholesale market | DERA under a single interconnection point | Yes | No |
| 2a | Multiple DER, Single Circuit: Wholesale | DER aggregation, DERA, with multiple DER interconnection points on a single circuit participating in wholesale market | DERA under multiple interconnection points on a single circuit | Yes | No |
| 2b | Multiple DER, Multiple Circuits: Wholesale | DER aggregation, DERA, with multiple DER interconnection points on multiple circuits participating in wholesale market | DERA under multiple interconnection points on multiple circuits | Yes | No |
| 3 | Single DER: Distribution | DER with single interconnection point providing distribution services to DO | DERA under a single interconnection point | No | Yes |
| 4a | Multiple DER, Single Circuit: Distribution | DER aggregation, DERA, with multiple DER interconnection points on a single circuit providing distribution services to DO | DERA under multiple interconnection points on a single circuit | No | Yes |
| 4b | Multiple DER, Multiple Circuits: Distribution | DER aggregation, DERA, with multiple DER interconnection points on multiple circuits providing distribution services to DO | DERA under multiple interconnection points on multiple circuits | No | Yes |
| 5 | Single DER: Wholesale + Distribution | DER with single interconnection point participating in wholesale market and providing distribution services to DO | DERA under a single interconnection point | Yes | Yes |
| 6a | Multiple DER, Single Circuit: Wholesale + Distribution | DER aggregation, DERA, with multiple DER interconnection points on a single circuit participating in wholesale market and providing distribution services to DO | DERA under multiple interconnection points on a single circuit | Yes | Yes |
| 6b | Multiple DER, Multiple Circuits: Wholesale + Distribution | DER aggregation, DERA, with multiple DER interconnection points on multiple circuits participating in wholesale markets and providing distribution services to DO | DERA under multiple interconnection points on multiple circuits | Yes | Yes |

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# *Distribution Operations – Use Cases*

| ISO IOU T&D Interface - Use Case Deliverables | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| For each use case document information requirements, data exchange, tools and systems under the following conditions: Day Ahead, Hour Ahead, 15 minutes and Real-Time. | | | | | | | | | | |
| How do the needs change if the DERP is available energy vs dispatchable? | | | | | | | | | | |
| | | | | | | | | | | |
| | DO DERP Capacity Designation | | | | | | | | | |
| Operations Scenario | Available | Derated | Unavailable | | | | | | | |
| Business as Usual Normal Configuration | | | | | | | | | | |
| Business as Usual Abnormal Configuration | | | | | | | | | | |
| Planned Outage/Maintenance | | | | | | | | | | |
| Forced Outage/Emergency | | | | | | | | | | |

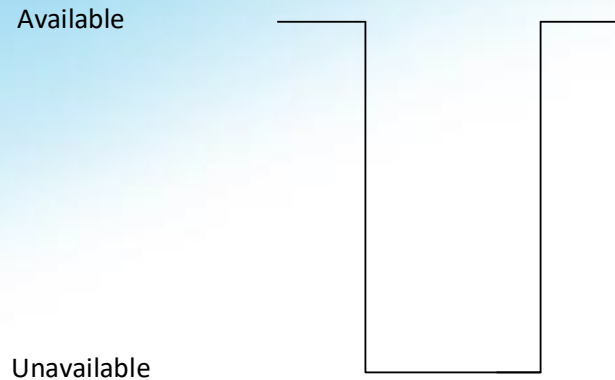# *Distribution Operations – State 1*

Available

Unavailable

Figure 1 – Simple Case

Available means entire DERA is not impacted by either an abnormal configuration, planned outage or forced outage.

Unavailable means entire DERA is impacted by either an abnormal configuration, planned outage or forced outage.
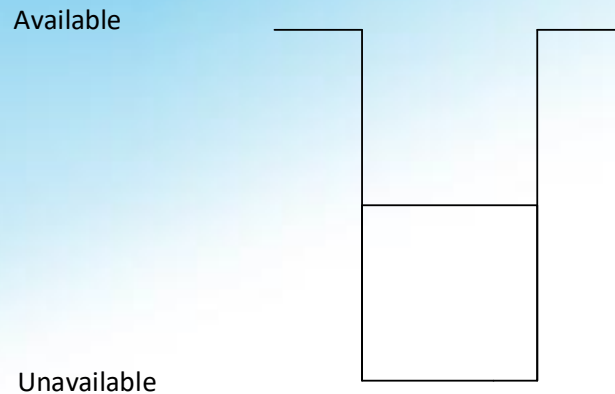
Available



Unavailable

Figure 2 – Hybrid Case

Derate means a portion of DERA is impacted by either an abnormal configuration, planned outage or forced outage.
A)For a single circuit connected DERA today there is no derate capability; however, a derate may be possible in a multi-circuit multi-unit DERA.
B) In order to have a single circuit DERA derate the DO must be able to review the abnormal configuration, planned outage or forced outage to determine if any of the DERA could supply services to the market.

# *Distribution Operations – Use Cases*

| Day Ahead | DO DERP Capacity Designation | | | ISO | DO | DERP |
|---|---|---|---|---|---|---|
| Operations Scenario | Available | Derated | Unavailable | | | |
| Business as Usual Normal Configuration | x | | | DER on HV | DER Amps | |
| Business as Usual Abnormal Configuration | | | x | | DER Amps | |
| Planned Outage/Maintenance | | | x | | DER Amps | |
| Forced Outage/Emergency | | | x | | DER Amps | |
| | | | | | | |
| Hour Ahead | DO DERP Capacity Designation | | | ISO | DO | DERP |
| Operations Scenario | Available | Derated | Unavailable | | | |
| Business as Usual Normal Configuration | x | | | | DER Amps | |
| Business as Usual Abnormal Configuration | | | x | | DER Amps | |
| Planned Outage/Maintenance | | | x | | DER Amps | |
| Forced Outage/Emergency | | | x | | DER Amps | |
| | | | | | | |
| 15 minutes Ahead | DO DERP Capacity Designation | | | ISO | DO | DERP |
| Operations Scenario | Available | Derated | Unavailable | | | |
| Business as Usual Normal Configuration | x | | | | DER Amps | |
| Business as Usual Abnormal Configuration | | | x | | DER Amps | |
| Planned Outage/Maintenance | | | x | | DER Amps | |
| Forced Outage/Emergency | | | x | | DER Amps | |
| | | | | | | |
| Real Time | DO DERP Capacity Designation | | | ISO | DO | DERP |
| Operations Scenario | Available | Derated | Unavailable | | | |
| Business as Usual Normal Configuration | x | | | | DER Amps | |
| Business as Usual Abnormal Configuration | | | x | | DER Amps | |
| Planned Outage/Maintenance | | | x | | DER Amps | |
| Forced Outage/Emergency | | | x | | DER Amps | |
| | | | | | | |
| Combination A is ISO - DER on HV and DO - DER Amps | | | | | | |
| | | | | | | |
| DER on HV - Aggregated capacity on the high-side bus of the substation transformer | | | | | | |
| DER Amps - DER production presented on high-side of the distribution service transformer | | | | | | |

| | DO DERP Capacity Designation | | | ISO | DO | DERP |
|---|---|---|---|---|---|---|
| **Day Ahead** | | | | ISO | DO | DERP |
| Operations Scenario | Available | Derated | Unavailable | A plus below | A plus below | |
| Business as Usual Normal Configuration | x | | | From DERP size/bids/meter data | From ISO schedule? | From DO capacity        From ISO schedule |
| Business as Usual Abnormal Configuration | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node   From ISO schedule |
| Planned Outage/Maintenance | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |
| Forced Outage/Emergency | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |
| | | | | | | |
| **Hour Ahead** | | | | ISO | DO | DERP |
| Operations Scenario | Available | Derated | Unavailable | A plus below | A plus below | |
| Business as Usual Normal Configuration | x | | | From DERP size/bids/meter data | From ISO schedule? | From DO capacity        From ISO schedule |
| Business as Usual Abnormal Configuration | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |
| Planned Outage/Maintenance | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |
| Forced Outage/Emergency | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |
| | | | | | | |
| **15 minutes Ahead** | | | | ISO | DO | DERP |
| Operations Scenario | Available | Derated | Unavailable | A plus below | A plus below | |
| Business as Usual Normal Configuration | x | | | From DERP size/bids/meter data | From ISO schedule? | From DO capacity        From ISO schedule |
| Business as Usual Abnormal Configuration | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |
| Planned Outage/Maintenance | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |
| Forced Outage/Emergency | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |
| | | | | | | |
| **Real Time** | | | | ISO | DO | DERP |
| Operations Scenario | Available | Derated | Unavailable | A plus below | A plus below | |
| Business as Usual Normal Configuration | x | | | From DERP size/bids/meter data | From ISO schedule? | From DO capacity        From ISO schedule |
| Business as Usual Abnormal Configuration | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |
| Planned Outage/Maintenance | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |
| Forced Outage/Emergency | | | x | From DERP size/bids/meter data From DO outage data | From ISO schedule? | From DO capacity/P Node From ISO schedule |

Combination B is ISO - DERP size/bids/meter data and DO outage data, DO - ISO schedule?, DERP DO capacity/P Node & ISO schedule

DERP size - aggregated DER MW size bid into wholesale market

DERP bid - the MW amount of the DER bid into wholesale market in the appropriate time frame

DERP meter data - actual production data based upon ISO schedule for settlement purposes

DO Outage date - after the fact distribution outage data that occurred which might impact DERP participation

ISO schedule - the ISO dispatch schedule awarded to the DERP

DO capacity - binary available or unavailable state of the DERP based upon distribution conditions

P Node - the P Node to which the DERP is connected based upon distribution conditions

Questions?

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